Macroinvertebrate Filtering-collector Guild on River Channel Snags

Expectation: Re-establishment of a snag-dwelling invertebrate community with passive filtering-collectors accounting for the greatest proportion of mean annual density and biomass. This community likely will include at least one taxon of Hydropsychidae* (e.g., *Cheumatopsyche* spp., *Hydropsyche* spp.), one taxon of Philopotamidae* (e.g., *Chimarra* spp.) or Polycentropodidae* (e.g., *Polycentropus* spp., *Cyrnellus* spp.), one taxon of Simuliidae* (e.g., *Simulium* spp., *Prosimulium* spp.) and one taxon of filtering-collector Chironomidae* (e.g., *Rheotanytarsus* spp.).

* Taxa from these families will be used as indicator taxa for assessing restoration success.

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Relevant Endpoint(s):
Restoration - Biological Integrity - Community Structure
Restoration – Biological Integrity – Biodiversity
Restoration – Biological Integrity – Food Web Structure
Restoration – System Functional Integrity - Habitat Quality
Restoration – System Functional Integrity – Habitat Use

Baseline Conditions: Mean annual density and biomass of snag-dwelling macroinvertebrate functional feeding groups was calculated for river channels in Pools A and C during each of the two years of baseline sampling. Four quarterly samples (Year 1) and two quarterly samples (Year 2) were averaged to calculate mean annual density and biomass for Year 1 and 2, respectively. Within Pool A, gathering-collectors accounted for 42.7% and 27.7% of total numbers in Year 1 and 2, respectively, followed by shredders (23.7% and 4.7%, respectively), scrapers (18.3% and 49.1%, respectively), predators (12.6% and 17.1%, respectively), filtering-collectors (2.4% and 1.3%, respectively), and vascular plant piercers (0.2% and 0.2%, respectively). Within Pool A, scrapers accounted for 60.8% and 63.2% of total biomass in Years 1 and 2, respectively, followed by predators (17.6% and 28.2%), shredders (10.4% and 1.4%, respectively), gathering-collectors (10.0% and 7.0%, respectively), filtering-collectors (1.2% and 0.2%, respectively), and vascular plant piercers (0.04% and 0.03%, respectively). Within Pool C, gathering-collectors accounted for 34.9% and 28.6% of total numbers in Year 1 and 2, respectively, followed by scrapers (23.0% and 29.7%, respectively), shredders (17.0% and 23.1%, respectively), predators (14.0% and 16.7%, respectively), filtering-collectors (10.2% and 1.6%, respectively), and vascular plant piercers (0.9% and 0.3%, respectively). Within Pool C, predators accounted for the greatest proportion of total biomass 29.8% and 59.6% of total biomass in Year 1 and 2, respectively, followed by shredders (31.6% and 8.2%, respectively), scrapers (27.0% and 24.5%, respectively), gathering-collectors (10.0% and 7.3%, respectively), filtering-collectors (1.3% and 0.4%, respectively), and vascular plant piercers (0.2% and 0.06%, respectively). Most snag-dwelling invertebrate taxa within the channelized system are common inhabitants of lentic environments, and are expected to occur in very low numbers on snags within reconnected river channels.

Reference Conditions:	Prior to 1930, most large woody debris (snags) was cleared from the river channel to facilitate navigation (USACOE 1992; Sedell and Minear 1995); however, smaller woody debris including coastal-plain willow (*Salix caroliniana*) remained. Historical data on snag-dwelling invertebrate community structure in the Kissimmee River are not available. Reference conditions have been derived from current literature describing aquatic macroinvertebrate functional group composition on snags within blackwater river/floodplain systems of the southeastern United States (Benke et al. 1984; Smock et al. 1985; Thorp et al. 1985; Stites and Benke 1989; Pescador et al. 1995) and personal observations on the occurrence of snag-dwelling fauna characteristic of southern Coastal Plain rivers within Pool B and other lotic systems within the upper and lower Kissimmee basins.
Mechanism Relating Restoration to Reference Conditions:	Because most passive filtering-collectors are sedentary and have evolved various sieving mechanisms for removing particulate matter from suspension, continuous flows are necessary to transport fine particulate organic matter which can be captured and utilized as a food source by these macroinvertebrates. Restoration of an aquatic invertebrate passive filtering-collector guild on river channel snags will be a function of colonization rates, once continuous flow has been reestablished. Colonizing lotic taxa will displace most existing lentic taxa and account for the greatest proportion of mean annual numbers and biomass. Colonization is likely to occur through downstream transport (drift) of larvae, and through direct oviposition by adults. Many typical passive filtering-collector taxa occur in other lotic systems (e.g., Crater Creek, Fisheating Creek, Tiger Creek, Cypress Creek, and Weohykapka Creek) within upper and lower Kissimmee basins (Pescador et al. 1995; J.W. Koebel Jr., personal observation), and should colonize quickly. *Chimarra* spp. was collected from Pool C snag habitat on one date during the baseline period. Numbers and biomass of this taxon should increase as a result of reestablished continuous flow.
Adjustments for External Constraints:	All filtering-collector taxa likely to colonize snags occur within the Kissimmee-Okeechobee ecosystem; therefore, there are no external constraints that would delay or preclude restoration of a filtering-collector guild within this habitat.
Means of Evaluation:	Sampling of existing snag habitat likely will commence within six months following initiation of the interim upper basin regulation schedule and reestablishment of continuous flow through reconnected river channels. Post-construction sampling methods will be identical to those outlined in Anderson et al. (1998), and include collection of monthly, replicate (5, minimally) snag samples from randomly selected locations within reconnected channels of Pool C and remnant channels of Pool A. Samples will be analyzed for number of indicator species, functional feeding group association, density, and standing stock biomass for each taxon. Replicates will be averaged for each sampling date to determine mean density and biomass of functional feeding groups for each date. Mean annual density and biomass for each functional feeding group will be calculated from the mean values for each sampling date collected over a 12-month period. Results will be compared to the stated expectation.

Time Course for Restoration:	Following reestablishment of continuous flow, restoration of snag-dwelling biota will be a function of colonization rates. For existing snags, colonization by several indicator taxa (primarily dipterans) likely will occur within 6 - 12 months. Larger taxa (e.g., caddisflies) likely will colonize within 12 - 18 months. Because indicator taxa are rare or absent within the channelized system, the time frame for achieving the stated expectation may be extended depending on the distance indicator taxa must travel to colonize.

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Table 1: Mean annual density and biomass for macroinvertebrate functional feeding groups from several southeastern Coastal Plain blackwater river systems.

River System	Functional Group	% of Total Density		% of Total Biomass		Reference
		Year 1	Year 2	Year 1	Year 2	
Channelized Kissimmee River, FL	Filtering-collectors					Anderson et al. 1998
	Pool A	2.4	1.3	1.2	0.2	
	Pool C	10.2	1.6	1.3	0.4	
	Gathering-collectors					
	Pool A	42.7	27.7	10.0	7.0	
	Pool C	34.9	28.6	10.0	7.3	
	Predators					
	Pool A	12.6	17.1	17.6	28.2	
	Pool C	14.0	16.7	29.8	59.6	
	Scrapers					
	Pool A	18.3	49.1	60.8	63.2	
	Pool C	23.0	29.7	27.0	24.5	
	Shredders					
	Pool A	23.7	4.7	10.4	1.4	
	Pool C	17.0	23.1	31.6	8.2	
	Plant Piercers					
	Pool A	0.2	0.2	0.04	0.03	
	Pool C	0.9	0.3	0.2	0.06	
Satilla River, GA	Filtering-collectors					Benke et al. 1984
	Upper Site	79.9		64.6		
	Lower Site	75.4		21.0		
	Gathering-collectors					
	Upper Site	16.4		6.6		
	Lower Site	21.0		6.7		
	Predators					
	Upper Site	3.7		28.8		
	Lower Site	3.6		18.2		
Cedar Creek (upstream site)	Filtering-collectors	26.3		66.1		Smock et al. 1985
	Gathering-collectors	50.5		5.8		
	Predators	23.2		28.0		
Steel Creek, SC (outflow site)	Filtering-collectors	38.8		NA		Thorp et al. 1985
	Gathering-collectors	30.8		NA		
	Predators	9.8		NA		
	Scrapers	20.7		NA		